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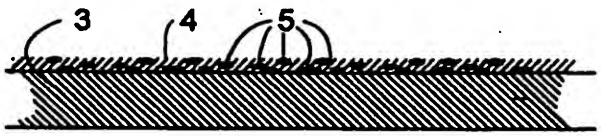
(54) Title: A COLOUR CHANGING CASING FOR A DEVICE

(57) Abstract

A colour changing casing (6) for a device contains a compound (2, 5) which changes colour under the effect of ultraviolet light. In order to change the colour of the casing under ultraviolet radiation either completely or on desired section (7), the compound is mixed either into the base material (1) of the casing or into its coating (4).



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A colour changing casing for a device

The invention relates to the creation of a desired visual effect in the outer casing of a portable device, for instance an electronic device.

Many small-sized portable devices, especially electronic devices such as mobile phones, mobile radios, cassette players, computers and pocket calculators comprise a plastic and/or metal outer casing serving not only as protection and a mechanical component, but also to give the product the desired appearance. Plastic or metal has a specific basic colour, and if one wishes to give the casing some other colour, it has to be treated with a coloured paint or lacquer. Due to the current fierce competition manufacturers have to strive to appeal to consumers by means of various visual effects.

A coloured casing of a new type has now been found for the devices of the kind mentioned above. The casing of the device in accordance with the invention changes colour completely or partly as a function of the intensity of the ultraviolet radiation it is exposed to. This phenomenon is produced by using a colourant which changes colour when exposed to ultraviolet radiation as a constituent in the casing material itself or in the paint, lacquer or other coating applied to its surface. At the filing date of this utility model application, the chemical compound known *per se* and sold under the trade name Photopia, which has been developed by Matsui Shikiso Chemical Co. Ltd., is considered the most advantageous colourant in this respect. Other ultraviolet light susceptible compounds have been disclosed for instance by EP patent specifications 487 792, 461 491, 635 410, WO patent specification 87/03086 and EP patent specification 140 540. The device casing in accordance with the invention is characterised by the features defined in the characterising clause of the claim.

The device casing of the invention may have for instance two colours: a basic colour which is visible when the casing is not exposed to ultraviolet radiation, and in the most preferred embodiment, the colour called Photopia, which becomes visible when the casing is exposed to ultraviolet radiation from the sun for instance. By contrast, the basic colour becomes visible when the device is transferred to a place where it is not exposed to ultraviolet radiation. At the filing date of this utility model application there are 15 different Photopia colours.

The compound i.e. pigment which changes colour under ultraviolet light can be compounded during the production into the moulding compound from which the casing is made. Suitable plastics are e.g. ABS/PC (polycarbonate), PP (polypropylene), PE (polyethylene) and PVC (polyvinyl chloride) and a resin known under the trade name K Resin. A second option is mixing a compound which changes colour under ultraviolet light into a paint or a lacquer suitable for painting the plastics mentioned above. The application of the second option makes it easy to form numbers, letters and other patterns on the device casing, which will appear only when the device casing is exposed to ultraviolet radiation. The Photopia compound mentioned above has proved more advantageous than other known compounds especially in connection with painting, when the final result is compared to the price of the treatment. Sections with different colours may be formed in the same casing with the use of Photopia or similar compounds of different colours in the coating of these sections. Nevertheless, the final result will be more resistant if the Photopia or similar compound is mixed into the moulding resin. Various extrusion and other techniques known *per se* in the production of plastic objects enable an area of a desired shape containing Photopia or a similar compound to be formed in the plastic casing, or the plastic casing to be made of two or more parts containing Photopia or similar compounds of different colours.

The application of the invention to a mobile phone casing will be described below by way of example and with reference to the enclosed figures, of which figure 1 shows a partial cross-section of a casing made by mixing Photopia compound into its moulding resin, figure 2 shows a partial cross-section of a casing with Photopia compound mixed into the paint applied to its surface and figure 3 shows how a pattern on a mobile phone casing becomes visible under the effect of ultraviolet radiation. Because of the example, the disclosure focuses on the use of the Photopia compound mentioned above, however, the possibility of using any similar compounds is not excluded in this conjunction.

In figure 1 the mobile phone casing consists of a plastic blend 1, into which Photopia compound 2 has been mixed during the production. For clarity's sake the figure shows the Photopia compound as grains poorly admixed with the resin; in reality, a resin blended with Photopia compound is very homogeneous. Also for the sake of clarity, figure 2 is a distorted view of plastic casing 3 in cross-section, coated with paint 4, which has been admixed with Photopia compound 5. In figure 3, a specific pattern 7 has been painted with a paint containing Photopia compound on casing 6 of the mobile phone. The more intense the ultraviolet radiation to which

the mobile phone casing is exposed, the more distinctly the difference of colour produced by the Photopia compound distinguishes pattern 7 from the basic colour of casing 6.

In order to achive the desired final result, the blending of a pigment which changes colour under ultraviolet radiation with a moulding resin, paint or lacquer has to be performed following a specific course of actions. The Photopia compound mentioned above cannot be mixed with ABS plastic, because, during the moulding of the plastic product in question, the ABS plastic has to be heated to such a high temperature that the Photopia compound decomposes. However, the Photopia compound can be used mixed into the moulding resin for instance in the production of products from polypropylene, because polypropylene does not require heating to such a high temperature that does ABS plastic. The lower stiffness of polypropylene, which is naturally less stiff than ABS plastic, can be compensated for by mixing talc or any other substance known *per se* into the polypropylene mass, thus stiffening the end product. By these means, it is possible to obtain equally good stiffness characteristics of polypropylene as those of ABS plastic.

When mixing Photopia compound into the polypropylene mass one has to consider the effect of the raw polypropylene supplied by different manufacturers on the colour of the final product. For the injection moulding of polypropylene the Photopia compound is supplied by manufacturers as transparent pellets usually containing SHOAROMER MG-471 made by Showa Denko as the base material. In the pellet composition, the base material accounts for 95±%, while 5±% consists of the actual colourant reacting to ultraviolet light, a universal colourant and a stabilising agent. The pellets are mixed with the desired raw polypropylene (which is also in the form of grains or pellets) in a ratio of 5-10 percent by weight before the injection moulding is started. The raw polypropylene may consist of the SHOAROMER MG-471 mentioned above, POLYPRO BJ 340A supplied by Tonen Petroleum & Chemical Company, PP M-1604 supplied by Asahi Kasei or any polypropylene which has proved suitable. Among the named raw polypropylenes the two last ones have proved to have a tendency to alter the final colour of the product towards a reddish shade, compared with SHOAROMER MG-471.

To allow the Photopia compound to be mixed into the paint, it has first to be mixed as such into an organic solvent and to be simultaneously heated to approx. 80-90°C, preferably above 85°C. Suitable solvents are found for instance among alcohols (methanol, isopropyl alcohol and isobutyl alcohol), hydrocarbons (n-hexane,

cyclohexane, methyl-cyclohexane, xylene and toluene), halogenated hydrocarbons (carbon tetrachloride and trichlorobenzene), ketones (methyl-ethyl-ketone, cyclohexanone, ethyl acetate, butyl acetate, D.O.P.) and other solvents as well (nitroethane, D.M.F., ethyl-cellosolve). In a preferred embodiment the Photopia compound is cautiously mixed with xylene having a flash point of 27.4°C, and is heated to a temperature above 85°C in a water bath, carefully avoiding static sparking. Owing to its relatively high boiling point, xylene is one of the most advantageous organic solvents available. It is also advantageous to use a xylene or a solvent having as high a flash point as possible. The mixing ratio is approx. 1 percent by weight of Photopia compound to 99% of solvent. To compensate for evaporation the proportion of solvent may be higher before the heating. After cooling, the mixture of solvent and Photopia is mixed into the desired paint or lacquer in a ratio of approx. 1 volume part of mixture to 20 volume parts of paint or lacquer.

Claim

A colour changing casing (6) for a device, **characterised** in that it contains a compound (2, 5) which changes colour under the effect of ultraviolet light in order to change the colour of the casing under ultraviolet radiation either completely or on desired sections (7), the compound being mixed either into the base material (1) of the casing or into its coating (4).

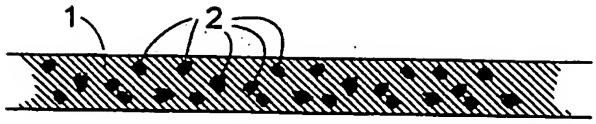

FIG. 1

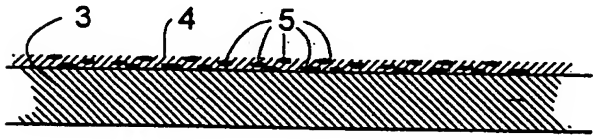

FIG. 2

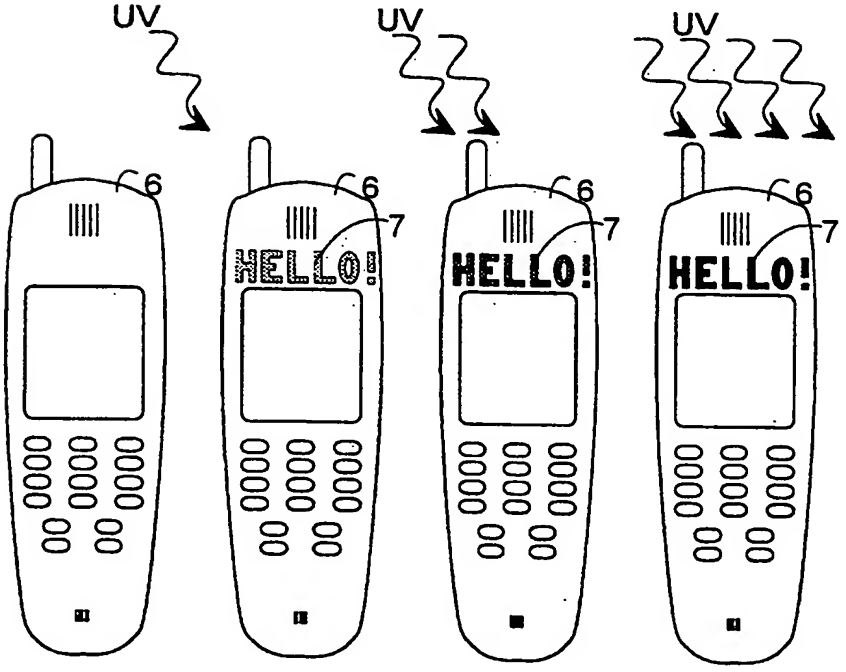

FIG. 3